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DATA EVALUATION RECORD

1. Chemical: Chlorpyrifos-methyl (Shaugnessy #059102)

2. Formulation: 96% purity (material identified by #AGR-142688 and Wildlife International ID #WI-576.)

3. Citation: Beavers, Joann B. 1978. Eight-day dietary LC_{50} -- Bobwhite Quail -- Chlorpyrifos-methyl. Wildlife International Ltd., Easton, MD (EPA Accession #242149; Report #7)

4. Reviewed by: James D. Felkel
   Wildlife Biologist
   Ecological Effects Branch/HED

5. Date Reviewed: May 27, 1980

6. Test Type: Avian dietary LC_{50}

   A. Test Species Bobwhite Quail (*Colinus virginianus*)

7. Reported Results: The acute LC_{50} of Chlorpyrifos-methyl in the Bobwhite Quail is 2010 ppm (95% confidence limits 1649-2450 ppm).

8. Reviewer's Conclusions: The study is scientifically sound. With an LC_{50} of 2010 ppm, Chlorpyrifos-methyl is slightly toxic to Bobwhite Quail. The study does fullfill the requirement for an avian dietary LC_{50} study for an upland game bird.

Materials/Methods

A. Test procedure

14-day old Bobwhite Quail reared from Wildlife International Ltd.'s production flock, were used. Wildlife International game bird starter ration and tap water were available *ad libitum* throughout the study, and a photoperiod of 14 hours of light per day was used. Binds were randomly assigned to five (5) experimental pens, five (5) lab standard pens, and five (5) control pens. All pens had 10 birds each. Technical Dieldrin with a purity of 87% was used as the lab standard (positive control).

The Chlorpyrifos-methyl and the Dieldrin were each disolved in corn oil in concentrations such that the addition of two (2) parts by weight added to 98 parts of the food resulted in a logarithmic series of dosage levels as shown below:

Dietary Concentration (ppm)

1. Control: Basal diet only
2. Lab standard: 21.5, 31.6, 46.4, 68.2, 100.0
3. Experimental: 562, 1000, 1780, 3160, 5620

A five-day exposure period followed by a three-day toxicant-free period was used. Body weights by pen were recorded at the start and end of the study and food consumption estimated per pen for the five-day exposure period. Mortality and symptoms of toxicity were recorded daily.

B. Statistical Analysis

Probit analysis was used to analyze mortality data.

Discussion/Results

The following table presents the cumulative mortality for birds receiving the test chemical, those receiving the laboratory standard, and the controls receiving no toxicant:

CHLORPYRIFOS METHYL

Dosage ppm	Time of Death Day 1	2	3	4	5	6	7	8
562	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
1000	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
1780	0/10	0/10	0/10	2/10	4/10	4/10	4/10	4/10
3160	0/10	0/10	0/10	5/10	9/10	9/10	9/10	9/10
5620	0/10	0/10	1/10	5/10	10/10	10/10	10/10	10/10

LC_{50} is 2010 ppm, confidence limits (95%) 1649 to 2450 ppm.

LABORATORY STANDARD

Dosage ppm	Time of Death Day 1	2	3	4	5	6	7	8
21.5	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
31.6	0/10	0/10	0/10	1/10	2/10	3/10	4/10	4/10
46.4	0/10	0/10	0/10	4/10	6/10	6/10	7/10	7/10
68.2	0/10	0/10	2/10	6/10	8/10	1/10	10/10	10/10
100.0	0/10	1/10	4/10	10/10	10/10	10/10	10/10	10/10

LC_{50} is 37 ppm, confidence limits (95%) 32 to 43 ppm.

CONTROLS

Dosage ppm	Time of Death Day 1	2	3	4	5	6	7	8
0	0/10	1/10	1/10	2/10	3/20	3/10	3/10	3/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10
0	0/10	0/10	0/10	0/10	0/10	0/10	0/10	0/10

The following table presents the average body weight, per year, for the birds studied as well as the estimated food consumption during the five-day exposure period.

Material	Concentration ppm	Average Body Weight (g) Day 1	Day 8	Total Estimated Food Consumption During Five-Day Exposure Period g
Chlorpyrifos	562	29	38	329
methyl	1000	29	32	300
	1780	27	29	184
	3160	27	26	71
	5620	29	*	54
Laboratory	21.5	26	43	265
Standard	31.6	31	41	250
	46.4	30	40	190
	68.2	30	*	188
	100.0	28	*	72
Controls	0	30	36	245
	0	30	47	342
	0	29	46	371
	0	29	42	312
	0	30	40	409

*Data not available due to total mortality.

With Chlorpyrifos-methyl, lethargy, wing droop, loss of coordination, and a ruffled appearance were seen prior to death at the three higher dose levels (where mortality occurred). No such symptoms were seen at the two lower dose levels. A dose-related reduction in both food consumption and body-weight gain occurred. The LC_{50} was found to be 2010 ppm (confidence limits 1649-2450 ppm).

Symptoms of toxicity prior to death also occurred in those individuals receiving Dieldrin. The LC_{50} for Dieldrin calculated as 37 ppm. Mortality in the controls (7%) was attributed to "toe picking," a form of cannibalism.

Reviewer's Evaluation

A. Test Procedure

Test standards in EPA Proposed Guidelines (1978) require that the test substance be stored under conditions that maintain its stability. It should be stated whether these conditions were maintained. All other procedural requirements appear to have been met.

B. Statistical Analysis

The submitted LC_{50} value of 2010 ppm is consistent with results calculated by this reviewer using the submitted data and probit method without adjustment for control mortality.

Calculation of an LC_{50} using Abbot's correction for control mortality produces a slightly higher LC_{50} value (2043.6 ppm) Use of the lower LC_{50} value submitted provides for a greater margin of environmental safety and is therefore acceptable. The LC_{50} calculations for the laboratory standard, Dieldrin, were also valid for the data provided.

C. Discussion/Results

The LC_{50} value of 2010 ppm is in the "slightly toxic" range, following EPA-approved toxicity category terminology (Brooks, H.L., et. al., 1973). The LC_{50} of 37 ppm for the laboratory standard, Dieldrin, is consistent with the calculation of this LC_{50} by other laboratories (e.g., Hill, E., et. al., 1975), and control mortality was below the maximum permissable level of 10%.

An analysis of the food consumption results was undertaken by this reviewer. Food consumption data indicate that consumption dropped off from 6.58 g/bird/day at 562 ppm of chlopyrofos-methyl to 1.59 g/bird/day at 5620 ppm, with an estimated 2.5 g/bird/day at the calculated LC_{50} level of 2010 ppm of toxicant (these values are adjusted for mortality that occurred.) This means that at the concentration expected to kill 50% of the birds, the typical test bird would have eaten only about 36% of the mean daily amount of food consumed by the control birds (6.864 g/bird/day). Since the above repellancy occurred even in the absence of alternative food sources, it is quite possible that a similar repellency by birds would occur in the field. If such a repellancy did not occur, then a substantially lower level of toxicant in the food (as low as 36% of the submitted LC_{50} value if no repellency occurred) would result in a 50% mortality level. Depending on the field situation, the entire feeding area of any given bird on local population could be treated with the toxicant, in which case uncontaminated foods would not exist. If the birds fed at normal (e.g., control) levels, they would receive a higher dose at any given treatment level than actually occurred in the experimental situation where repellancy occurred. If the birds fed at reduced levels, they could incur starvation or reduced production of offspring.

D. Conclusions

1. Category: Core

2. Rationale: Although (1) no statement was provided regarding the conditions under which the test substance was stored and (2) food repellency occurred, the data are judged to be Core since the methods and results otherwise appear satisfactory.

   Before any field application is permitted by the Agency, it must be determined whether any repellancy would occur to the wildlife foods that would be contaminated. If so, then it must be determined what the effect of this repellency would be (*e.g.*, mortality or reduced offspring production). If no repellency or reduced repellency is expected, then the expected LC_{50} value in the field could be substantially lower than the value submitted and the resulting increased hazard must be evaluated.

Repairability: N/A.

Citations: Brooks, H.L., et al. 1973. Insecticides Cooperative Extension Service, Kansas State University, Manhattan, Kansas.

Hill, E.F., et. al. 1975. Lethal dietary toxicities of environmental pollutants to birds. U.S. Fish and Wildlife Service Special Scientific Report -- Wildlife #191, Washington, D.C. 61 pp.